

Investigating the Effect of Plate Spacing and Length on the Performance of Graphene Nano-Electromechanical Switches Using Molecular Dynamics Method

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Abstract

Reducing the size of nano-switches is very important in terms of integration, but possibly for some reasons such as empirical obstacles or theoretical complexity, nano-switches with small lengths have not been studied yet. In this study, the performance of graphene nano-switches with small lengths (less than 30nm) and very low plate spacing (about nm²) was simulated using a combination of molecular dynamics and method of moments. The obtained results were compared with some of the available theoretical models. The results reveal that by decreasing the length of the nano-ribbons or increasing the distance between plates, the pull-in voltage of the nano-switches is increased. The results also illustrate that in long-length nano-ribbons, there is a good agreement with theoretical results, but in the short ones, the existing theoretical relations are not sufficiently precise and cannot predict the pull-in voltage accurately. Furthermore, the results show that the switching times of the simulated nano-switches are considerably less than conventional nano-switches.

Keywords: nano-switch, graphene, molecular dynamics, method of moments

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